

Carboniferous, Devonian, and Old Red, Messrs. Morton and Strahan; for Silurian, Cambrian, and Pre-Cambrian, Messrs. Lapworth and Marr. For chemical, dynamical geology, petrology, and mineral veins Messrs. Bauerman and T. Davies.

The last-mentioned committee is specially to consider the question of nomenclature under the following general heads: (1) Terms founded on physical characters; (2) founded on mineral composition; (3) founded on names of places; (4) founded on local peculiarities and common usage; (5) founded on theories of origin and other hypotheses; (6) synonyms; (7) suggestions for systematising and for unification of nomenclature.

The Sub-commission or General Committee has Prof. Hughes for its chairman, and Mr. E. B. Tawney for its secretary; its duty is to receive the reports of the Committees and to consider the value of terms. The list of names forming the Sub-Commission includes those of Mr. Etheridge, P.G.S., Professors Bonney, Boyd Dawkins, Haughton, Hull, Judd, Lebour, Morris, Prestwich, Rupert Jones, and Seeley; Doctors Clement Le Neve Foster, Evans, Geikie, J. Geikie, Hicks, Nicholson, and Sorby, and the names already mentioned, of members acting as Reporters, Secretary, and the Chairman. The Sub-Commission consider that the word *system* should be used as the term indicating the largest sub-division, applied to a group which stands by itself, easily and clearly distinguishable from the rocks above and the rocks below, bounded above and below by triads in stratigraphical regions, and characterised by special forms of life. *Formation* expresses a smaller group, with some lithological and palæontological characters in common, but which may be in continuous sequence with the rocks above and below. *Deposit* implies similarity of lithological character. *Layers, laminae, bed, group, series, and rock* are still under discussion. *Zone* and *horizon* were defined; but *cycle* and *data* were left open questions.

Through the liberality of His Majesty the King of Italy, the committee of organisation are able to offer a prize of 5000 francs for the best suggestion for an international scale of colours and conventional signs practically applicable to geological maps and sections, including those of small scale. The index of colours and signs should be accompanied by maps representing regions of varied geological structure, and by an explanatory memoir in the French language. The documents should be marked with a motto, which should be placed on the outside of an envelope containing the name of the author, which will not be opened until the Congress, when the name of the successful competitor will be made known. The index and accompanying papers should be sent in to Prof. J. Capellini, director of the Museum at Bologna, by the end of May. The award will be made by a jury of five chosen from the presidents of sub-commissions. Should no index be thought worthy of the grand prize, the best will receive a gold medal of the value of 1000 francs, while to the two next will be given medals of silver and bronze of similar shape. C. E. DE RANCE

### THE FALLS OF NIAGARA IN WINTER

IN the first week of last February it fell to my lot to make very hurriedly the transcontinental journey of 3500 miles from San Francisco to New York. Before starting I resolved that the one stoppage which I could allow myself *en route* should be made at Niagara. I had visited the Falls in the early summer of 1879, and was so profoundly impressed by them that I could not resist the opportunity of seeing them again under their wintry aspect; and I was confirmed in my resolve by seeing statements in various American papers to the effect that, owing to the long-continued and exceptionally severe cold of the present winter, the Ice-mountains at the Falls were

higher than had ever been previously known. These statements were confirmed to me on the spot by several persons long resident in the village.

Two or three preliminary notes on the journey across the Rocky Mountains in midwinter may not be without interest for the readers of NATURE. I left San Francisco on February 2nd in the midst of most serious floods, and on that particular day they attained their maximum, which was one inch higher than any previously recorded. It was estimated that 3500 square miles of the most fertile land of California was under water, and in many parts steamboats of light draught were plying over the country. Any assessment of damage would have to be made by millions of dollars. I heard many and grievous complaints of the damage done to the agricultural interests of the country by the "hydraulic mining," which washed the hillsides down into the river beds, filling them up, and thus prevented much flood-water from being carried off. In some places the railroad track had been apparently washed away, for it could not be found, and from this cause our journey to Sacramento was lengthened about fifty miles, as the gigantic ferry-boat *Solano* could not be used for the short route. This boat has four tracks upon it, and will carry twenty-four cars. As each car seats fifty people, this is equal to carrying a train that will accommodate 1200 people. It has four side-wheels, each with its engine and set of boilers. In crossing the Sierras we encountered little snow, but a great deal of rain. The greatest amount of snow on the journey was in the upper part of the Weber Cañon, 100 miles east of Ogden and Salt Lake. Here there had been considerable difficulty in keeping the line open during January, but the train-service had not been interrupted for a single day, although the snow-sheds and snow-ploughs were constantly required. That the weather had been unusually severe was shown by the very large number of dead cattle along the line, from Ogden across the Laramie plains, and also, I was informed, in Colorado. In the four days between San Francisco and Omaha (where we arrived punctually), the terminus of the Pacific Railroad, the temperature was never below 26° F., and the air so still that I frequently saw smoke-rings from the locomotive funnel expand to 6 or even 8 feet diameter, rising perhaps 30 or 40 feet in doing so. All the cars were warmed, usually to too great an extent, from 70° to 75° F., being the normal temperature for the interior of railway cars, hotels, private houses, and schools, as far as my experience went.

East of the Missouri (which, like all the rivers I crossed, was frozen over) trains were everywhere very much delayed, owing to snowstorms, or to the slippery state of the rails, which were coated with ice. The utmost caution was used by those in charge of trains, and a strong impression was left on my mind that safety, and not speed or punctuality, was the primary consideration in such American railway management as I came across.

On leaving Chicago a phenomenon presented itself which is common enough in America, though but rarely seen in this country, and never on so gigantic a scale. For several days the temperature had been very low, and every object was exceedingly cold. On the night of February 6th, the air-temperature rose to 33° F., and fine rain fell. This froze upon everything and encased it with transparent ice, from which in many instances delicate icicles depended. Sad havoc was played with the overhead telegraph wires in Chicago itself (which were broken by the weight); but on leaving the city in the early morning the exceeding beauty of the whole country, usually so uninteresting from its flatness, became apparent. A light coating of snow lay on the ground, but everything, every twig, every dead leaf, every blade of grass, had its own transparent covering, which in the occasional gleams of the sun shone with the most gorgeous colours.

For seven or eight hours we travelled through this, a distance of some 250 miles, and I heard of similar | and simultaneous appearances over larger tracts of country.



Gigantic icicle under Table Rock, photographed in January, 1881. The upper right-hand corner is rock, and a portion of the Canadian (or Horse-Shoe) Fall is seen on the left. The whole of the apparent ground is a mass of frozen spray which has accumulated many feet in thickness on the shingle, &c., at the foot of the rock.

Probably the most wonderful exhibition ever seen, of | Falls of Niagara. A large number of readers of NATURE  
not frozen rain, but frozen spray, was to be found at the | have visited them, and possibly all are sufficiently familiar



with their topography, through the medium of books and photographs, to render any general description unnecessary. I will therefore confine myself to the special features produced by this winter's cold.

The whole district lay under a thin coating of snow, and all the roads were in good condition for sleighing, indeed those near the Falls were so completely ice-covered with frozen spray, as to render no other mode of locomotion possible. Those who have seen both places have probably been struck, as I was, with the strong resemblance between the gorge of the Niagara river below the Falls, and the gorge of the Avon at Clifton, Bristol. The latter is the finer of the two, being narrower, and having higher sides, but both are limestone gorges, and similar in character. In the Niagara gorge numerous springs discharge themselves into the chasm at various points in the precipitous rocky sides, and at these points numerous collections of huge and massive icicles appeared as though adherent to the rock, measuring perhaps seventy or eighty feet in length, and eight to ten feet in irregular diameter. In the exquisite purity of their colour and general appearance, they reminded me strongly of the pillars of ice in the upper part of the Rhone glacier.

The width of the river itself was not a little lessened, both in the rapids above and the comparatively still water below the Falls, by the ice at the banks, and it was a matter of surprise to notice how much ice accumulated at the edges of water that was running very rapidly. At the top of the American Fall itself there were so many accumulations of ice that the Fall was actually divided into five separate and distinct Falls, in the same way as, even in summer, that portion of the Fall which is in front of the "Cave of the Winds" is cut off by rocks on the upper edge, from the main body of the Fall.

The mention of the "Cave of the Winds" recalls also that huge boulder, the "Rock of Ages," in front of this portion of the Fall. That however is only one of many others in front of the American Fall, and these boulders are, as it were, gigantic nuclei, round which the frozen spray accumulates, and produces the Ice-mountain of which we hear so much, and the remains of which are not unfrequently to be seen even by summer visitors. The average height of this is about half the total height of the Fall, but this winter it has attained to the unprecedented height of within twenty feet of the top of the Fall! This highest point is at about one-third of the total width of the Fall, measuring from Goat Island. Between the foot of the incline from Prospect Park and the edge of the Fall is another very high mass. The ice approaches very close to the front of the Fall, and the whole basin into which the water descends is thus closely surrounded, and partially covered, with an enormous and irregular mass of pure semi-transparent ice, of (on the day of my visit) the most beautiful emerald green hue! Later in the day I had the good fortune to fall in with Mr. Bradford, the artist who is so well known for his pictures of Greenland scenery, and in discussing the ice cones formed at waterfalls, he mentioned that, having passed a winter in the Yo Semité valley in California, he had seen an ice-cone close to one of the celebrated Falls there, which was at least 600 feet in height.

Within the last few years a considerable portion of "Table Rock" has fallen away. In its present condition a stream of water about one foot in thickness falls over it in summer, and, owing to the amount of its overhanging, it is easy to get between this Fall and the rock, and thus to be "behind Niagara." At the time of my visit (February 8th), however, the whole of this portion of the Fall was *completely frost-bound*. Enormous icicles, of the most surpassing beauty, depended from the rock above, while at my feet were masses of the frozen spray from the Horseshoe Fall. The intense emerald green of the water of that Fall, seen through and between these magnificent ice-

pendants, could be reproduced by no artist, but will never be effaced from my memory. The accompanying woodcut, photographed on to the wood block from a photographic picture taken a few days prior to my visit, will, to those who know the place, give some faint idea of the beauty of the scene, and of the gigantic scale of the icicles. It is scarcely necessary to say, perhaps, that the circular wooden staircase by which the descent under Table Rock is effected, was covered with many feet thickness of ice on the side next the Fall. As the air-temperature was slightly above 32° F. and the icicles were occasionally falling around us, my guide was unwilling that I should remain long, or make any attempt to measure any of the ice-masses.

The fourth, and to the casual visitor perhaps the most remarkable effect of the cold in the immediate neighbourhood of the Falls, is the manner in which every surrounding object is coated with an immense thickness of frozen spray. The trees on Goat Island and in Prospect Park are thus covered to a slight extent, and present a very beautiful appearance. The strangest examples, however, occur on the Canadian side, close to the Horseshoe Fall, where huge irregularly-shaped masses of ice are seen, some of which resemble, in general form, merely a colossal bunch of grapes standing erect on its stalk. A little investigation shows that these are trees, staggering under the weight of tons of ice. Not unnaturally they have many broken branches, and have almost invariably lost their tips. In one instance which I saw, and of which I obtained a photograph, the spray had so accumulated in front of the trunk of a tree about nine inches in diameter, that it had formed a wall of ice *five feet* in width, and of the same thickness as the diameter of the tree-trunk. A flagstaff planted on Table Rock had four or five projections from its top, varying from three to five feet long, and looking like "frozen streamers," or as though watery flags had been flying, and had suddenly been frozen. These were so inaccessible and so dangerous to the passer-by, that they were daily shot down with rifle-bullets! The museum with its pagoda and the adjoining houses close to the Horseshoe Fall were cased with sheet-ice and pendant icicles to such an extent that much of the frozen spray had to be removed daily with an axe.

I mounted to the pagoda (well remembered, I have no doubt, by summer tourists) and there I listened to the "Music of Niagara," of which Mr. Eugene Schuyler has given in the February number of *Scribner's Magazine* an account so interesting, that I venture to conclude this article with a short abstract of it.

Mr. Schuyler starts with the statement that "the tone of Niagara was like that of the full tone of a great organ. So literally is this true that I cannot make my meanings clear without a brief outline of the construction of that great instrument." He then explains the mutual relation of the various pipes, the "ground-tone, over-tones or harmonics, and under-tones or sub-harmonics," and relates his experiences in the Cave of the Winds, on Luna Island above the Central Fall, at the Horseshoe Fall among the rapids, and at the Three Sister Islands. "In fact, wherever I was, I *could not* hear anything else! There was no *roar* at all, but the same great diapason—the noblest and completest one on earth!" Further details of visits to various points are given, and it is interesting to notice that although previously unacquainted with the difference in height of the two Falls, Mr. Schuyler unhesitatingly pronounced the Horseshoe Fall to be several feet lower than the other, guided solely by his musical ear. He then proceeds thus:—

"Now, what is this wonderful tone of Niagara? or rather, what are all these complex tones which make up the music of Niagara? With more or less variation of pitch at various points (to be accounted for), here are the notes which I heard everywhere:—



Just these tones, but *four octaves lower!*

"At once it will be incredulously replied, 'No human ear ever has heard, or ever can hear, tones at such a depth.' I arrived at my conclusions both theoretically and practically, and the two results coincided exactly." For the explanation of this, those interested will do well to consult the article itself. It may be noted here, however, that notes 3 and 4 were heard *everywhere*; that the 5th and 6th were perfectly distinct, but of far less power; that the 7th (the interval of the tenth) was of a power and clearness entirely out of proportion to the harmonics as usually heard in the organ, &c.; and that the 8th, 9th, and 10th notes were only heard occasionally and with a transient impression. Mr. Schuyler then points out that, allowing for the fact that the diameter of Niagara is the *greatest* possible compared with its height, the length of an organ-pipe necessary to give the key-note of Niagara (four octaves below note 1 in the diagram) would be just the average height of the Falls! The figures given are 170'66 feet - 10'24 feet = 160'42 feet, where the 10'24 feet is the allowance for the extra diameter of Niagara treated as an organ-pipe.

It appears, then, that the tone of Niagara is, *note for note*, the dominant chord of our natural scale in music. Its rhythm is one note per second, with three notes in each measure, the first note being the accented one, and the single beats are represented by groups of three semi-quavers, where M.M. 60 =  $\text{♪♪♪}$  or three times three, three times repeated.

Mr. Schuyler thus concludes in words with which I heartily sympathise. "I have spoken only of the pitch and rhythm of Niagara. What is the *quality* of its tone? Divine! There is no other word for a tone made and fashioned by the Infinite God. I repeat, there is no *roar* at all—it is the sublimest music on earth!"

WILLIAM LANT CARPENTER

#### ZOOLOGICAL RESULTS OF THE VISIT OF PROF. K. MOEBIUS TO MAURITIUS.

THIS work, which is illustrated by a map and twenty-two plates, contains the results of the investigations of Prof. Möbius on the marine fauna of Mauritius and the Seychelle Islands, embodying the account of observations made by him on the spot, and of work done on the collections which he brought home with him on his return from his visit to the islands. It commences with an account of the journey to Mauritius in 1874-75; an account of the Suez Canal is given, and of the voyage through the Red Sea, where Trichodesmium, the yellowish-red floating algæ supposed by some to have given the name to the sea, was met with in abundance. After the well-known tanks of Aden and the Somali divers who surround every ship that comes into the port have been described, Réunion is touched at, and at last Mauritius.

A concise account is given of the geographical, geological, and climatic peculiarities of this island, which is about one-third the size of Holstein. The centre of the island is occupied by a plateau elevated over 1700 feet above sea-level, the highest point being 2711 feet in height. The plateau is surrounded on nearly all sides by mountains, and from these on all sides but the northern,

where there is a gradual inclination, rivers and streams fall down very steep slopes with frequent waterfalls into the sea. Rains are very heavy, and the mountain torrents swell with remarkable rapidity. The geological structure of the island is entirely volcanic, with the exception of beds of coral rock. The mean temperature of the year is about 25°85 C. Rain is most abundant from December to May. The prevailing wind is the south-east trade. Cyclones are sometimes experienced in the period, December to April, but do not occur every year.

Mauritius had originally no mammalian inhabitants excepting bats. The great fruit-bat (*Pteropus vulgaris*) is abundant in the woods. These fruit-bats are easily tamed. One of them was a great pet of Mr. G. Clark, now dead, who was the author of "A Brief Notice of the Fauna of the Mauritius," published in the *Mauritius Almanac* for 1859, and containing some very good observations. This tame bat was taken when young from its mother's breast and brought up by hand. It could not fly, because its wing membranes had been cut through to prevent its doing so. It usually passed its time hanging on to the back of a chair. Directly Mr. Clark came into the room it cried out loudly to be nursed. If it were not taken up at once it climbed up to him, rubbed its head against him, and licked his hands. If Mr. Clark sat down the bat hung on at once to the back of the chair, and followed all the movements of its master with its bright eyes. If its master caught hold of a fruit it climbed forth with down his arm to his hand to get its share, and it always got two teaspoonsful out of every cup of tea or coffee. If Mr. Clark took any kind of object in his hand the bat climbed to it, examined it with its eyes and nose, and only returned to its chair-back after completely satisfying its curiosity. It followed its master even into the open air if the door was not shut to prevent its getting out.

A good many mammals have been introduced into the island, and are now abundant. A monkey from the East Indies (*Macacus cynomolgus*) inhabits the woods, and makes excursions from thence to plunder the sugar-cane fields. One of the species of the curious hedgehog-like insectivora of Madagascar (*Centetes ecaudatus*) was introduced in the island at the end of the last century. The animals live in damp places and lie in a state of sleep (= hibernation) in the dry season, sleeping then so soundly that they do not awake even when dug up. As soon as the rainy season begins in November they wake up and breed, producing three litters of fifteen or sixteen young every year. The young follow the mother, who calls them with a grunting noise, in a row behind, and protects them when molested with her teeth and spines. A full-grown male weighs as much as four pounds. The animals are so abundant that on a moonlight night with trained dogs twenty or thirty may be caught by one hunter. They are eaten by the working classes.

Besides these there is a shrew mouse, also introduced from the East Indies, a small hare, and the ubiquitous common rat, both of which latter gnaw and destroy the sugar-cane. A stag (*Cervus hippelaphas*) introduced by the Portuguese inhabits the woods. It breeds in July and August, and casts its horns in December or January.

We cannot follow the author in his short reference to the birds and account of the fish. The coral-reefs of the island appear to abound with animal life of all kinds. Several of the corals composing them are laid dry constantly at low tide, and remain exposed to the air without injury. *Goniastrea retiformis* and *Leptoria gracilis* are cited as examples of such. Whilst these corals are in this condition, the polyps remain entirely withdrawn, and the whole surface of the coral laid bare is covered with slime, which prevents its drying up.

In the Seychelles, of which a short account is given, the giant turtle (*Chelone virgata*) is kept in ponds as at Ascension, and is caught with a rope round the flipper, and dragged out to be slaughtered when convenient. The

\* Beiträge zur Meeresfauna der Insel Mauritius und der Seychellen, bearbeitet von K. Möbius, F. Richter und E. von Martens, u.s.w. (Berlin: Otto Enslin. 1880.)